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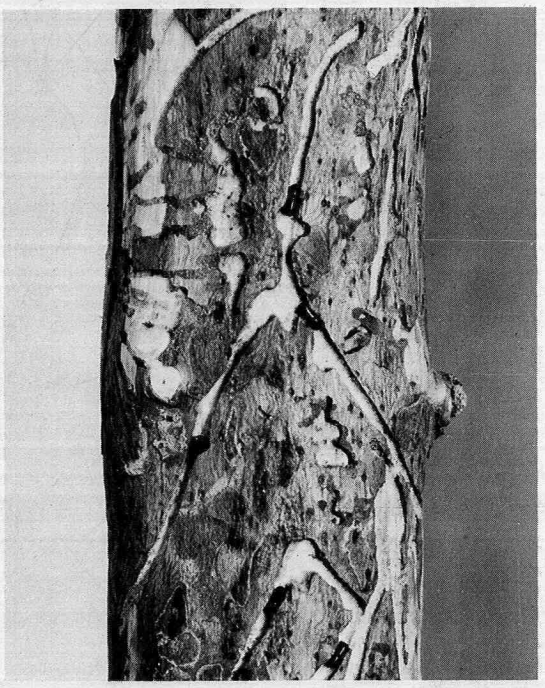
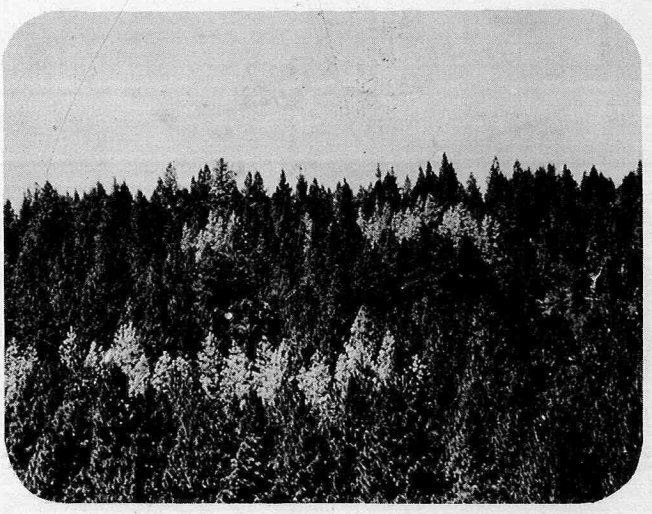
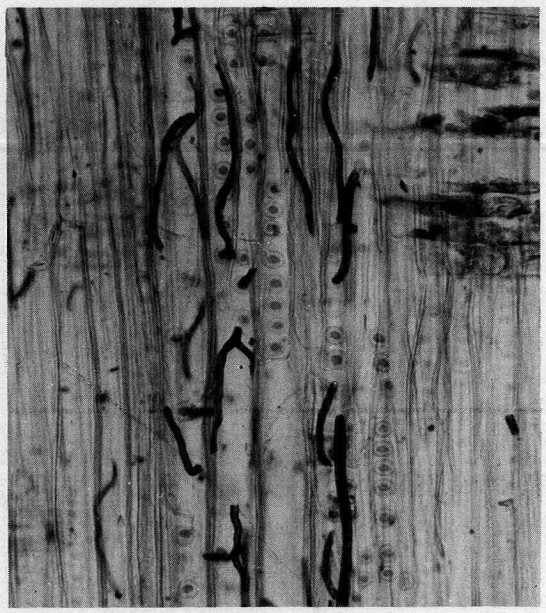
Forest Pest Conditions







In The Pacific Northwest

1976

This is the 29th annual report of forest pest conditions in Oregon and Washington based on cooperative surveys sponsored by the Northwest Forest Pest Action Council. The purpose of this report is to provide public and private land managers with information concerning pest conditions and to maintain a historical record of pest trends and occurrences. This report is based on information obtained from aerial and ground surveys conducted by the Forest Service, Oregon State Department of Forestry, Washington State Department of Natural Resources, and the surveillance efforts of private, State, and Federal foresters.

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COVER PHOTO: Western spruce budworm (adult moth), pine engraver (adult beetles in egg galleries on ponderosa pine), black stain root disease, *Verticicladiella wagenerii*, (hyphae in xylem of Douglas-fir), and mortality in ponderosa pine caused by mountain pine beetle.

FOREST PEST CONDITIONS
IN
THE PACIFIC NORTHWEST
1976

June 1977

Compiled by:

FOREST INSECT AND DISEASE MANAGEMENT
STATE AND PRIVATE FORESTRY
PACIFIC NORTHWEST REGION
FOREST SERVICE
U.S. DEPARTMENT OF AGRICULTURE

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INTRODUCTION

Forest insect and disease outbreaks were detected and recorded during aerial and ground surveys made in cooperation with the Oregon State Department of Forestry and the Washington State Department of Natural Resources. Ground surveys were conducted to verify aerial survey findings, evaluate stand conditions, make biological evaluations, monitor insect and pathogen populations, and to collect presuppression data necessary for control decisions.

Information concerning a number of insect pests of shade trees and ornamentals was obtained from Oregon State Department of Agriculture reports written by Dr. Richard Penrose and reports from the Oregon State Extension Service. These insects include the European pine shoot moth, smaller European elm bark beetle, and bronze birch borer.

The volume of timber killed by bark beetles was estimated from counts of dead trees made during the aerial survey. Volume losses resulting from defoliators, sucking insects, and diseases were not estimated.

Damage caused by the pine engraver and the balsam woolly aphid is no longer being recorded unless it is exceptionally severe or represents an extension of either insect's known range.

INSECT CONDITIONS IN BRIEF

Western spruce budworm and mountain pine beetle continued to be the most destructive insects in the Pacific Northwest. Western spruce budworm infestations in Washington increased significantly in size and intensity in mixed conifer stands in 1976. New defoliation was recorded in Douglas-fir and true fir stands on portions of the Okanogan and Wenatchee National Forests, the North Cascades National Park, and the Colville and Yakima Indian Reservations. In Oregon, the outbreak on the Warm Springs Indian Reservation continued at about the same intensity and size as in 1975. New defoliation was observed on the Malheur National Forest at Dixie Butte northeast of John Day, Oregon. Mountain pine beetle continued to cause heavy mortality in lodgepole pine and ponderosa pine stands in eastern Oregon. Losses on the Umatilla, Wallowa-Whitman, and Malheur National Forests, and adjacent State and private lands increased in size and intensity in 1976. Elsewhere, mountain pine beetle losses were noticeable on the Wenatchee and Colville National Forests and surrounding State and private lands in Washington, and the Deschutes, Winema, and Fremont National Forests and surrounding State and private lands in Oregon.

Douglas-fir bettle activity increased significantly on the Umatilla and Wallowa-Whitman National Forests. Losses were highest in the general area defoliated by the Douglas-fir tussock moth in 1972, 1973, and 1974. Douglas-fir bettle losses also increased significantly on the Siuslaw, Umpqua, and Willamette National Forests and surrounding lands in western Oregon.

Western pine beetle continues to cause heavy losses in ponderosa pine stands on the Malheur, Ochoco, Fremont, and Winema National Forests and surrounding lands in eastern Oregon.

No Douglas-fir tussock moth defoliation was recorded in either State.

DEFOLIATORS

Western spruce budworm, *Choristoneura occidentalis,* Free. Infestations of the western spruce budworm increased significantly in 1976. Approximately 1.1 million acres of Douglas-fir and true fir were defoliated to some extent this year. The majority of the defoliation occurred on the Okanogan and Wenatchee National Forests, adjacent State and private lands, and the North Cascades National Park in north-central Washington. Spruce budworm defoliation is summarized in Table 1.

Light defoliation was detected for the first time east of the Okanogan River. About 120 acres were defoliated on the Tonasket District, Okanogan National Forest, and 2,100 acres on the Colville Indian Reservation. Light to moderate defoliation, totaling about 3,310 acres occurred on the Yakima Indian Reservation in Washington. The outbreak on the Warm Springs Indian Reservation continues at about the same intensity and size as in 1975. A total of 10,800 acres was defoliated in 1976 as compared to 10,560 acres in 1975. A new outbreak of western spruce budworm was detected on 380 acres on the Malheur National Forest in the vicinity of Dixie Butte northeast of John Day, Oregon. The outbreak on the Wallowa-Whitman National Forest collapsed due to a late frost in June that killed most of the new buds and shoots, destroying the food supply of the budworm.

A cooperative control project was conducted against the western spruce budworm on the Okanogan and Wenatchee National Forests, adjacent State and private lands, and the Warm Springs Indian Reservation in the summer of 1976. Over 365,000 acres were treated in areas where defoliation has occurred for several consecutive years. About 358,000 acres were treated with Malathion ULV concentrate containing 95 percent active ingredient, applied at the rate of 13 ounces per acre. A total of 7,664 acres were treated with Sevin 4 Oil at the rate of 1 pound active ingredient in 32 ounces of formulated material diluted with 32 ounces of fuel oil per acre.

Fall egg mass surveys have been made in the treated and untreated areas. The data will be used to evaluate the potential for continued defoliation and assess the need for control action in 1977. Evaluation of these data and the preparation of a biological evaluation is in progress. Preliminary analysis of the data indicate that 1977 populations will be high in many areas, particularly in the untreated areas. Direct control is being considered. The number of acres that might be proposed for treatment and the insecticide to be used are undetermined at this time.

Modoc budworm, *Choristoneura viridis,* Free. Populations of this insect continued to cause light defoliation on the Fremont National Forest and adjacent State and private lands in south-central Oregon. An estimated 5,600 acres of white fir were defoliated in the north Warner Mountains and northeast of Gearhart Mountain. A fall egg mass survey was conducted by Oregon State Department of Forestry on State and private lands. Evaluation of the data indicates that the budworm population densities are static to declining. However, these populations could still cause light defoliation in some areas in 1977. Evaluations will continue to be made of these populations in the winter and spring of 1977.

Larch casebearer, *Coleophora laricella,* (Hbn.). Populations of this insect continued to defoliate western larch stands in eastern Oregon and Washington in 1976. No formal aerial survey was made to sketch map the spread and damage of this insect this year. However, observations made in the field indicate that defoliation was at about the same low level reported in 1975.

The range of the casebearer has expanded throughout the range of western larch on the eastside of the Cascade Mountains in Washington. It was observed infesting western larch at Sheep Butte on the Yakima Indian Reservation. Casebearer population densities in this area were not high enough to cause visible defoliation from the air.

Douglas-fir tussock moth, *Orgyia pseudotsugata,* McD. No defoliation caused by this insect was detected in either Oregon or Washington in 1976. However, individual larvae were recovered from defoliator monitoring plots on the Deschutes, Mt. Hood, Winema, Fremont, and Malheur National Forests in eastern Oregon and the Colville Indian Reservation in north-central Washington.

Low level populations were found for the sixth consecutive year at Mare's Egg Spring on the northwest side of upper Klamath Lake on the Winema National Forest.

Table 1.- Extent of western spruce budworm infestations in Oregon and Washington 1975-1976

Reporting Area	1975 Defoliation (Acres)	1976 Defoliation (Acres)
Oregon		
Malheur Area		
National Forest Lands	0	380
Wallowa-Whitman Area		
National Forest Lands	8,430	0
Warm Springs Indian Reservation	10,560	10,800
TOTAL OREGON	18,990	11,180
Washington		
Okanogan Area		
National Forest Lands [1]	163,440	330,760
National Forest Dedicated Lands [2]	5,010	14,790
Bureau of Land Management	0	390
State and Private Lands	1,880	8,040
TOTAL OKANOGAN AREA	170,330	353,980
Wenatchee Area		
National Forest Lands [1]	231,310	436,520
National Forest Dedicated Lands [2]	18,760	36,450
Bureau of Land Management	0	80
State and Private Lands	57,580	183,340
TOTAL WENATCHEE AREA	307,650	656,390
North Cascades National Park	35,050	73,060
Colville Indian Reservation	0	2,100
Yakima Indian Reservation	0	3,310
TOTAL WASHINGTON	513,030	1,088,840
REGIONAL TOTALS		
National Forests	426,950	818,900
National Parks	35,050	73,060
Bureau of Land Management	0	470
Indian Reservation	10,560	16,210
State and Private (Oregon)	0	0
State and Private (Washington)	59,460	191,380
GRAND TOTAL	532,020	1,100,020

[1] Excluding wilderness areas.
[2] Wilderness areas.

BARK BEETLES

The 1976 bark beetles losses in Oregon and Washington are summarized in Table 2.

Table 2. - Summary of 1976 forest epidemic infestations in Oregon and Washington for all bark beetle damage excluding Oregon pine ips.

Insects [1]	Infestation Centers Number	Area Acres	Number of Trees	Avg. Vol Per Tree MBF	Volume MBF
OREGON					
Douglas-fir beetle (eastside)	670	138,450	102,448	.376	38,546.105
Douglas-fir beetle (westside)	234	13,910	1,905	1.804	3,436.030
Douglas-fir engraver	1	70	10	.040	.400
Engelmann spruce beetle	17	470	230	.250	57.500
Fir engraver	582	64,620	27,963	.284	7,942.740
Flat-headed borer	84	8,290	738	.040	29.520
Mountain pine beetle (L)	1,130	1,165,310	2,183,878	.070	152,785.160
Mountain pine beetle (S)	39	3,880	219	.886	194.120
Mountain pine beetle (W)	78	8,730	1,383	.463	640.230
Mountain pine beetle (IP)	702	441,470	348,133	.060	20,887.980
Mountain pine beetle (MP)	214	101,890	85,473	.900	76,925.700
Western pine beetle	1,383	181,030	18,701	.751	14,049.660
OREGON TOTAL	5,134	2,128,120	2,771,081	.114	315,495.150
WASHINGTON					
Douglas-fir beetle (eastside)	305	36,420	16,490	.538	8,871.250
Douglas-fir beetle (westside)	8	380	80	.864	69.150
Douglas-fir engraver	3	110	30	.550	16.500
Engelmann spruce beetle	3	170	93	.250	23.250
Fir engraver	186	20,800	10,084	.253	2,555.700
Mountain pine beetle (L)	19	3,540	2,436	.070	170.520
Mountain pine beetle (W)	354	26,770	12,154	.449	5,451.910
Mountain pine beetle (IP)	168	7,080	1,495	.052	77.670
Western pine beetle	149	12,810	1,348	.552	744.250
WASHINGTON TOTAL	1,195	108,080	44,210	.407	17,980.200
REGION TOTAL BARK BEETLES	6,329	2,236,200	2,815,291	.118	333,475.350

[1] Mountain pine beetle infestation are designated by tree species: L, lodgepole; S, sugar pine; W, western white pine; MP, mature ponderosa pine; IP, immature ponderosa pine.

Flatheaded fir borer, *Melanophila drummondi,*(Kirby). Losses caused by this insect declined significantly in southwest Oregon in 1976. An estimated 8,290 acres of mortality of scattered pole-size Douglas-fir and ponderosa pine timber were found along the foothills of the Rogue and Umpqua River drainages in the vicinity of Medford, Grants Pass, and Tiller.

The sharp decline in losses this year from last year is attributed to an increase in precipitation that occurred in the spring of 1975. It is anticipated that losses next year will continue to decline since precipitation was again near normal this year.

Fir engraver, *Scolytus ventralis,* Lec. Populations of this insect declined in Oregon and Washington in 1976. Losses in true fir stands are estimated at 10.5 million board feet on 85,420 acres. Most of the damage occurred on the Fremont, Malheur, and Umatilla National Forests, and adjacent State and private lands in Oregon, and on the Colville and Umatilla National Forests in Washington.

Spruce beetle, *Dendroctonus rufipennis,*(Kby.).

Spruce beetle activity declined in Oregon and Washington in 1976. Widely scattered patches of tree mortality in Engelmann spruce stands were reported on the Umatilla and Colville National Forests in Washington and the Umatilla and Wallowa-Whitman National Forests in Oregon.

Douglas-fir beetle, *Dendroctonus pseudotsugae,* Hopk. Losses caused by the Douglas-fir beetle increased more than fourfold in Oregon and Washington in 1976. The insect killed an estimated 67.7 million board feet of Douglas-fir on 189,160 acres in both eastside and westside forests. The most significant losses occurred on the Umatilla National Forest and adjacent State and private lands in eastern Oregon and Washington. On this Forest alone an estimated 53.8 million board feet of Douglas-fir were affected. Most of this loss, 47.7 million board feet, was reported on the Walla Walla, Pomeroy, and Pendleton Ranger Districts. These areas were heavily defoliated by the Douglas-fir tussock moth in 1972, 1973, and 1974.

The Douglas-fir beetle also caused heavy losses on the Wallowa-Whitman National Forest in Oregon. The largest outbreak, involving about 1.6 million board feet of timber, was observed in the Hells Canyon Wilderness Area in the vicinity of the 1973 Freezeout Saddle Fire.

Scattered tree mortality was also observed on the Malheur, Rogue River, Siskiyou, Siuslaw, Umpqua, and Willamette National Forests in Oregon. In Washington, losses occurred on the Okanogan, Wenatchee, and Colville National Forests, and the Colville Indian Reservation.

Mountain pine beetle, *Dendroctonus ponderosae,* Hopk. The mountain pine beetle continued to cause heavy mortality in forested areas in Oregon and Washington. Mortality of lodgepole pine during 1976 is estimated at 152.8 million board feet on 1,168,550 acres. Major losses occurred on the Wallowa-Whitman, Umatilla, Fremont, Malheur, Deschutes, and Winema National Forests, and adjacent State and private lands in Oregon. Ground surveys revealed that in many of the areas where the insect has been epidemic for 7 or more years there is almost a total loss of all lodgepole pine over 4 inches in diameter. Elsewhere, scattered tree-killing was observed on the Ochoco, Rogue River, and Umpqua National Forests, Warm Springs Indian Reservation, and Crater Lake National Park in Oregon. In Washington, scattered losses were observed on the Wenatchee and Colville National Forests, and the Colville Indian Reservation.

Regionwide mortality in ponderosa pine stands increased significantly this year with nearly 97 million board feet affected. The most striking losses occurred in mature and second-growth ponderosa pine stands on the Umatilla, Wallowa-Whitman, and Malheur National Forests, and adjacent State and private lands in eastern Oregon. Nearly 350,000 acres of the infested ponderosa pine are located within the larger 1-million-acre mountain pine beetle outbreak in the lodgepole pine stands southwest of La Grande, Oregon. Losses in mature and immature ponderosa pine on National Forest lands in this area are estimated to be 60.1 and 11.4 million board feet, respectively, in 1976. Losses on adjacent State and private lands were 16.4 million board feet and 8.3 million board feet for mature and immature pine. Ground surveys indicate additional losses are occurring as the insect continues to attack green trees through the summer months.

Scattered losses were reported in sugar pine stands on the Rogue River, Siskiyou, Umpqua, and Winema National Forests. The trend of these outbreaks is unknown.

Mountain pine beetle losses in western white pine stands declined in 1976. Significant losses were observed, however, on the Wenatchee and Colville National Forests in Washington. An estimated 3.9 million board feet were killed on these two Forests this year.

Western pine beetle, *Dendroctonus brevicomis,* Lec. Western pine beetle infestations remained high throughout eastern Oregon and Washington in 1976. In Oregon, losses in mature and overmature ponderosa pine stands are estimated at 14.8 million board feet. The heaviest losses occurred on the Fremont, Malheur, and Ochoco National Forests, and adjacent State and private lands where an estimated 12.1 million board feet were killed.

OTHER INSECTS

European pine shoot moth, *Rhyacionia buoliana,* (Schiff.). Approximately 1,500 ornamental pines were treated in Woodburn, Marion County, and 3,000 ornamental pines were treated at Hermiston, Umatilla County, by the Oregon State Department of Agriculture. All trees were treated with Sevin. No infestations were found in forested areas.

Pine needle sheath miner, *Zelleria haimbachi,* Busck. This insect caused severe damage to ponderosa pine plantations near Klamath Falls, Oregon. The outbreak has persisted for 3 consecutive years.

This moth caused severe defoliation on plantations of shore pine and other ornamentals in Multnomah County, Oregon.

Balsam woolly aphid, *Adelges piceae,* (Ratz). Damage caused by this insect continued to be observed in true fir stands in western Oregon and Washington in 1976. No new outbreaks were detected in either State this year. However, some tree mortality was observed in subalpine fir stands infested with balsam woolly aphid on the Mt. Baker-Snoqualmie National Forest near Concrete, Washington. This outbreak was reported for the first time in 1975. No visible damage was observed in the Blue Mountains where the aphid was discovered in 1974.

Smaller European elm bark beetle, *Scolytus multistriatus,* (Marsh.). This insect is widespread throughout eastern Oregon. In western Oregon the beetle was found throughout an area estending from Scappoose on the Columbia River, southward through the Willamette Valley to the Oregon border. The species' western boundary currently appears to correspond roughly with the eastern foothills of the Coast Range. No beetles were found in any of the pheromone traps placed in the coastal Counties.

Fall webworm, *Hyphantria cunea,* (Drury) was found infesting ornamental shade trees in Marion County, Oregon. Populations appear to have increased this year.

Pine engraver, *Ips pini,* (Say). Approximately 7,030 acres of pine engraver damage were observed in Oregon and Washington this year. The heaviest damage was reported on the Malheur and Wallowa-Whitman National Forests and adjacent State and private lands.

A larch sawfly. Oregon State Extension Service reports finding a sawfly, possibly the two-line larch sawfly *Anoploynx occidens,* Ross, defoliating western larch in conjunction with larch casebearer southeast of La Grande, Oregon.

A white fir sawfly, near *Neodiprion abietis,* (Harris), was reported defoliating scattered white fir on State and private lands and the Winema National Forest near Klamath Falls, Oregon.

Western oak looper, *Lambdina fiscellaria somniaria,* Hulst., was reported defoliating isolated stands of Oregon white oak near Chehalis and Centralia, Washington. The insect was also taken in Oregon State Department of Agriculture light traps near Salem, Oregon. No defoliation was reported in Oregon this year.

BENEFICIAL INSECTS

Oregon State Department of Agriculture reports collecting and redistributing 308,000 larvae of the Cinnabar moth, *Tyria jacobaeae* L. in several Counties in western Oregon for the control of tansy ragwort, *Senecio Jacobea.* There were 227 releases made on private property and 81 on Bureau of Land Management and National Forest lands. In addition, the Siuslaw National Forest collected and released nearly 153,000 Cinnabar moth larvae on 153 release sites. Previous success of establishment has been good with *T. jacobaeae* L. being confirmed at present in 109 townships scattered throughout 13 Counties. In addition, approximately 34,000 adult tansy ragwort flea beetles, *Longitarsis jacobaeae* L., were released in October. Fifty releases were made and all 16 western Oregon Counties with tansy ragwort infestations received beetles, some for the first time. Beetles have been recovered at 19 of 29 pre-1976 liberations sites, and viable populations are currently known to occur in nine Counties.

DISEASE CONDITIONS IN BRIEF

Needle diseases and root rots appeared to be the most obvious disease problems in 1976. *Lophodermella concolor* caused a needle blight of lodgepole pine seedlings and saplings on several thousand acres in eastern Oregon. Damage resulted primarily in growth loss with no mortality. *Rhabdocline pseudotsugae* and *Phaeocryptopus gaeumannii* were frequently observed causing a needle blight in westside Douglas-fir stands, especially in offsite trees. *Elytroderma deformans* continued to cause needle blight and branch flagging in ponderosa pine stands in eastern Oregon and Washington. Branch dieback caused by *Cytospora abietis* was common on true fir in sections of central Oregon. Branch dieback and wilting (cause unknown) of big leaf maple was also observed throughout western Oregon and Washington.

Black stain root disease caused by *Verticicladiella wagenerii* was observed causing tree mortality, mostly in Douglas-fir, throughout western Oregon and Washington but a few mountain hemlock and ponderosa pine were also killed. *Armillariella mellea,* causing root rot over the entire Region, appears more serious in eastside stands. *Phellinus weirii* has been reported more frequently due to an increased awareness of the disease in the Region. *Phytophthora lateralis* continued its devastation in native Port-Orford-cedar stands in southwestern Oregon. *Rhizina undulata,* the causal agent of root rot in Douglas-fir seedlings, appears most damaging in Whatcom, Skagit, and Snohomish Counties of Washington.

Lodgepole pine needle blight. Lodgepole pine needle blight, caused by *Lophodermella concolor* (Dearn.) Darker, became highly visible over several thousand acres in eastern Oregon in 1976. The disease has been detected throughout an area extending from Prairie City to Ukian to Troy.

This disease was first reported in 1975 from a small area near John Day. The moist spring and early summer of 1975 apparently created idea conditions for buildup of inoculum and infection. The fungus infects current season's foliage, but damage does not become visible until the following spring when infected needles turn reddish-brown. The disease appears to be limited mostly to understory trees. Most infection occurs within 10 feet of the ground.

The major form of damage is reduced tree growth. It is unlikely the disease will persist long enough to kill trees.

We expect this disease to increase substantially in 1977 because weather conditions in 1976 should have been ideal for infection and spread.

Rhabdocline needle blight. Rhabdocline needle blight caused by *Rhabdocline pseudotsugae,* Syd. was frequently observed in westside Douglas-fir stands in 1976. In many cases offsite trees are the most severely damaged. Four stands near Cottage Grove, Oregon were evaluated for infection. Percent of stocking infected ranged from 6 to 42 percent. Rhabdocline needle blight should be even more common in 1977. It is unlikely many trees will be killed but there may be some growth loss.

Swiss needle cast. This disease, caused by *Phaeocryptopus gaeumannii* (Rhode) Petrak, is becoming more of a Christmas tree grower's problem each year. It behaves much like Rhabdocline in needle infection patterns. Several Douglas-fir Christmas tree plantations have become infested around Olympia, Shelton, and Winlock, Washington. Growers will probably have to consider control in some of these plantations. Manzate D has been registered for this disease in Wisconsin and the Federal registration should cover Washington.

Elytroderma needle blight. Elytroderma needle blight caused by *Elytroderma deformans* (Weir) Darker, continues to increase on ponderosa pine in eastern Oregon and Washington. This increase has been observed for about 3 years. Tree-killing has not been observed. Elytroderma should also increase substantially in 1977.

Rosellinia needle blight. The causal fungus is *Rosellinia herpotrichoides* Hepto and Davis, and the host is Douglas-fir. This is a nursery disease and the contributing factor is dense stocking and moist, warm weather. It was discovered in the Webster Nursery at Olympia. Control is accomplished by normal tree culling. Chemical control methods are being tested by the Washington State Department of Natural Resources' pathologists.

DIEBACK

True fir branch dieback. Branch dieback was common on true firs in the area between Bend and McKenzie Bridge, Oregon. Most of the dieback is caused by *Cytospora abietis* Sacc., a canker-forming fungus which infects branches through dwarf misteltoe infections. In some cases, stressed, non-mistletoed trees also become susceptible ty Cytospora infection. The amount of infection probably will remain about the same in future years.

Big-leaf maple dieback. Big-leaf maple throughout western Oregon and Washington was damaged by a disease of unknown cause. Damage appears as branch wilting and dieback. Some trees are completely killed.

ROOT DISEASES

Black stain root disease. Black stain root disease caused by *Verticicladiella wagenerii* Kendrick, was found killing trees in numerous stands throughout western Oregon and Washington. Douglas-fir is the species most commonly infected, but it has been found on mountain hemlock and ponderosa pine. In one case, disease spread from an individual center has been estimated at 9 meters per year, suggesting spread by insects. Average rate of spread seems to be 1 to 2 meters per year. Practically all of the infection centers have been found in plantations. Damage from this disease appears to be increasing. Several long-term plots have been established to evaluate damage and spread of this disease.

Armillaria root rot. Armillaria root rot caused by *Armillariella mellea* (Fr.) Kumm., was observed over the entire Region; however, this does not represent a dramatic increase. Damage is more serious in eastside stands. An area close to the south boundary of Crater Lake National Park has been extensively damaged. Close to 2,000 acres are involved. A survey of the area showed that 25 percent of the volume of the stand has been killed. Similar areas can be found in eastern Oregon and Washington. Guidelines for treating Armillaria-infected stands are being developed for foresters. An extensively damaged area near Glenwood, Washington is being used by Oregon State University for several research studies on epidemiology and control.

Laminated root rot. Laminated root rot caused by *Phellinus weirii* Gilbertson, continues to take its large yearly toll. Numerous additional infection centers have been reported principally because foresters are becoming increasingly aware of the disease. Guidelines for preventing and reducing losses have been published and are available to all interested persons. Copies can be obtained from Forest Service Forest Insect and Disease Management, Region 6.

Port-Orford-cedar root rot. Port-Orford-cedar root rot caused by *Phytophthora lateralis* Tucker and Milbrath, continues its devastation of the native cedar stands in southwestern Oregon, as well as in ornamental plantings in Oregon and Washington. Management guidelines for this disease are also being developed.

Rhizina root rot. Rhizina root rot, caused by *Rhizina undulata* (Fr.) Karst, was held responsible for extensive Douglas-fir seedling mortality in a 1-year-old plantation near Gold Bar, Washington in Snohomish County. This disease appears to be most damaging in the northern Washington Counties of Whatcom, Skagit, and Snohomish. Elsewhere it is less frequently observed.

STEM DISEASES

Dutch elm disease. Dutch elm disease has infected about 90 percent of the elms in Union, Oregon. Other communities affected are Nyssa and Ontario. The Oregon State Department of Agriculture is conducting surveys for the bark beetle vectors, and evaluating treatments to protect the elms. This fungus has not yet been detected in Washington. Major elm cities and areas are Walla Walla, the Yakima Valley cities, Wenatchee, and Spokane on the eastside. Seattle, Bellingham, Longview, and Vancouver have plantings of American Elm Also.

Walla Walla is a suspect area for initial infection due to its proximity to Oregon infection sites.

White pine blister rust. Western white pine and sugar pines are being evaluated for resistance of white pine blister rust at the Forest Service Dorena Tree Improvement Center. This work has been in progress since 1956. At the present time approximately 750,000 seedlings with high levels of resistance are being raised in Forest Service nurseries. The resistance is holding up well in outplantings.

Climatological injuries. With a few exceptions, damage from the severe drought in the late months of 1976 did not become visible in 1976. Drought injuries are expected to be widespread in 1977. Some trees may be killed outright from lack of water, others will succumb from insects and diseases because they were under severe moisture stress.

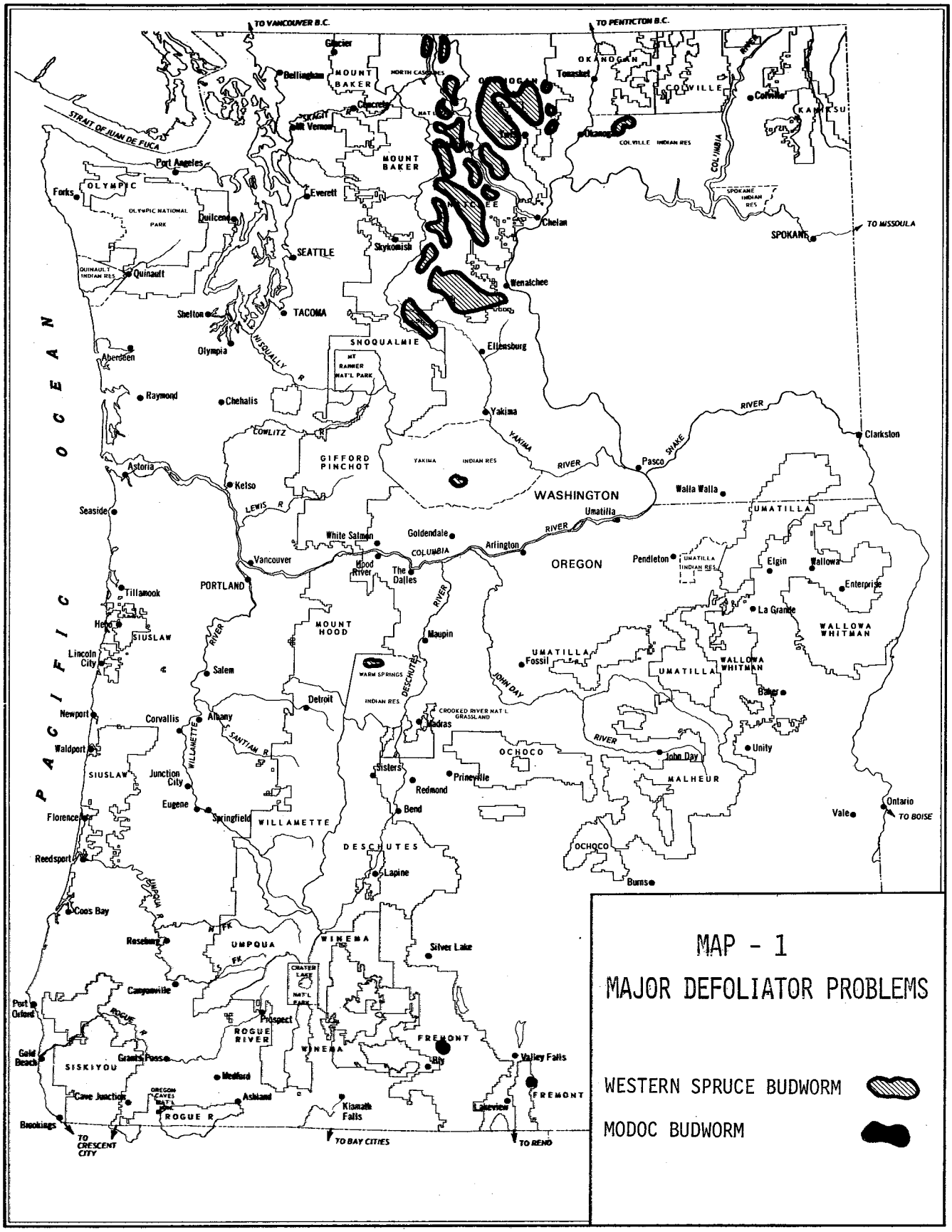
The number of trees killed by bark beetles and root diseases is expected to increase substantially in 1977 because of drought conditions.

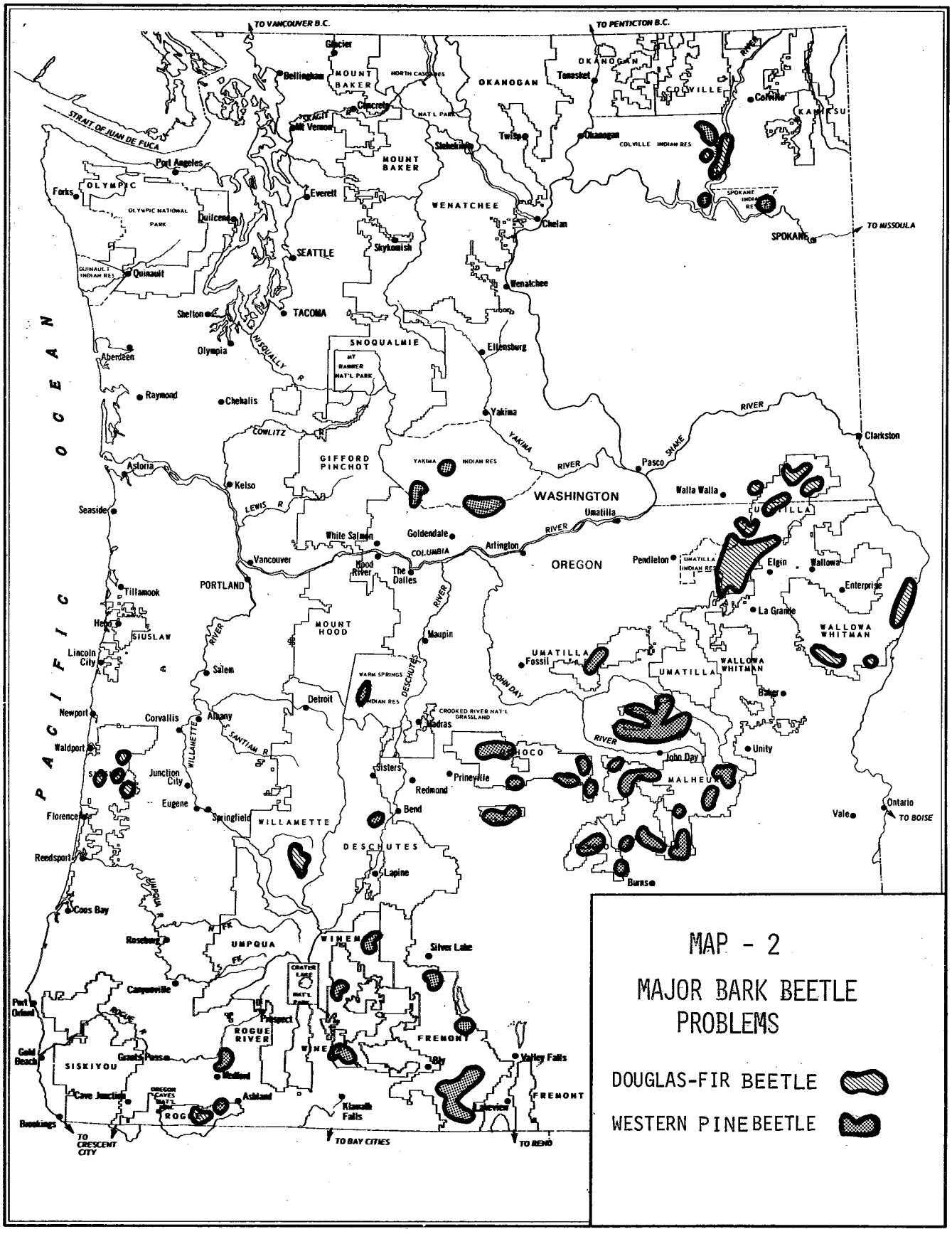
Unknown. A basal canker of unknown cause has been detected on several Douglas-fir seed orchard trees near Rochester, Washington. A similar canker has been reported on seed orchard trees in British Columbia. Investigations are underway to identify the cause.

APPENDIX

MAPS

1. **Major Defoliator Problems, 1976.**
2. **Major Bark Beetle Problems, 1976**
3. **Distribution of Mountain Pine Beetle in Lodgepole Pine, 1976.**
4. **Distribution of Mountain Pine Beetle in Ponderosa Pine, 1976.**


TO VANCOUVER B.C.
TO PENTICTON B.C.
TO MISSOULA
TO BOISE
TO CRESCENT CITY
TO BAY CITIES
TO REND
PACIFIC OCEAN
STR. NT. OF JUAN DE FUCA
WASHINGTON
OREGON
Glacier
Bellingham
MOUNT BAKER
NORTH CASCADES
Concrete
Mt. Vernon
SKAGIT R.
Tonasket
OKANOGAN
COLVILLE
Colville
KAMIAKEN
Okanogan
COLVILLE INDIAN RES
COLUMBIA
Port Angeles
OLYMPIC
Forks
OLYMPIC NATIONAL PARK
Everett
MOUNT BAKER
WENATCHEE
Chelan
SPOKANE INDIAN RES
SPOKANE
Quilcene
SEATTLE
Skykomish
QUINAULT INDIAN RES
Quinault
Wenatchee
Shelton
TACOMA
SNOQUALMIE
Olympia
Ellensburg
Aberdeen
MT RAINIER NAT'L PARK
Raymond
Chehalis
Yakima
YAKIMA
RIVER
SNAKE
Clarkston
COWLITZ R.
GIFFORD PINCHOT
YAKIMA INDIAN RES
Pasco
Astoria
Kelso
LEWIS R.
Walla Walla
Seaside
Umatilla
UMATILLA
White Salmon
Goldendale
COLUMBIA
Arlington
Vancouver
Hood River
The Dalles
Pendleton
UMATILLA INDIAN RES
Elgin
Wallowa
Enterprise
PORTLAND
Tillamook
Heceta
SIUSLAW
MOUNT HOOD
Maupin
La Grande
WALLOWA WHITMAN
Lincoln City
Salem
WARM SPRINGS INDIAN RES
DESCHUTES
Fossil
JOHN DAY
Baker
Detroit
Newport
Corvallis
Albany
CROOKED RIVER NAT'L GRASSLAND
Madras
Waldport
SANTIAM R.
WILLAMETTE
OCHOCO
John Day
Unity
Sisters
Prineville
MALHEUR
Junction City
Eugene
Springfield
Redmond
Bend
Ontario
Vale
Florence
WILLAMETTE
DESCHUTES
Reedsport
Lapine
Burns
Coos Bay
UMPQUA
WINEMA
Silver Lake
Roseburg
CRATER LAKE NAT'L PARK
Canyonville
Port Orford
Prospect
ROGUE RIVER
FREMONT
Valley Falls
Gold Beach
Grants Pass
SISKIYOU
Medford
Cave Junction
OREGON CAVES NAT'L
Ashland
Klamath Falls
Lakeview
ROGUE R
Brookings
MAP - 1
MAJOR DEFOLIATOR PROBLEMS
WESTERN SPRUCE BUDWORM
MODOC BUDWORM


TO VANCOUVER B.C.
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PACIFIC OCEAN
STRAIT OF JUAN DE FUCA
WASHINGTON
OREGON
TO MISSOULA
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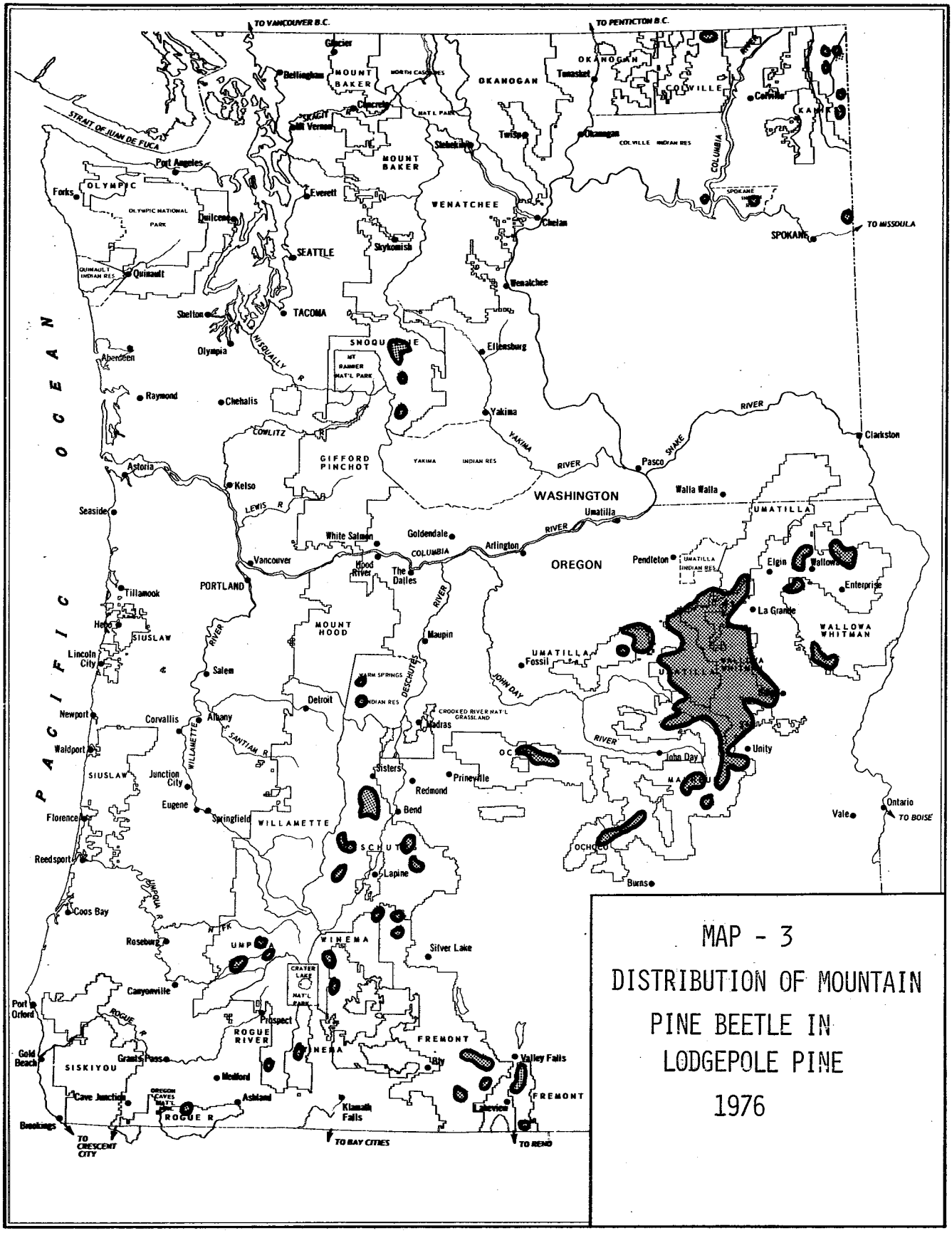
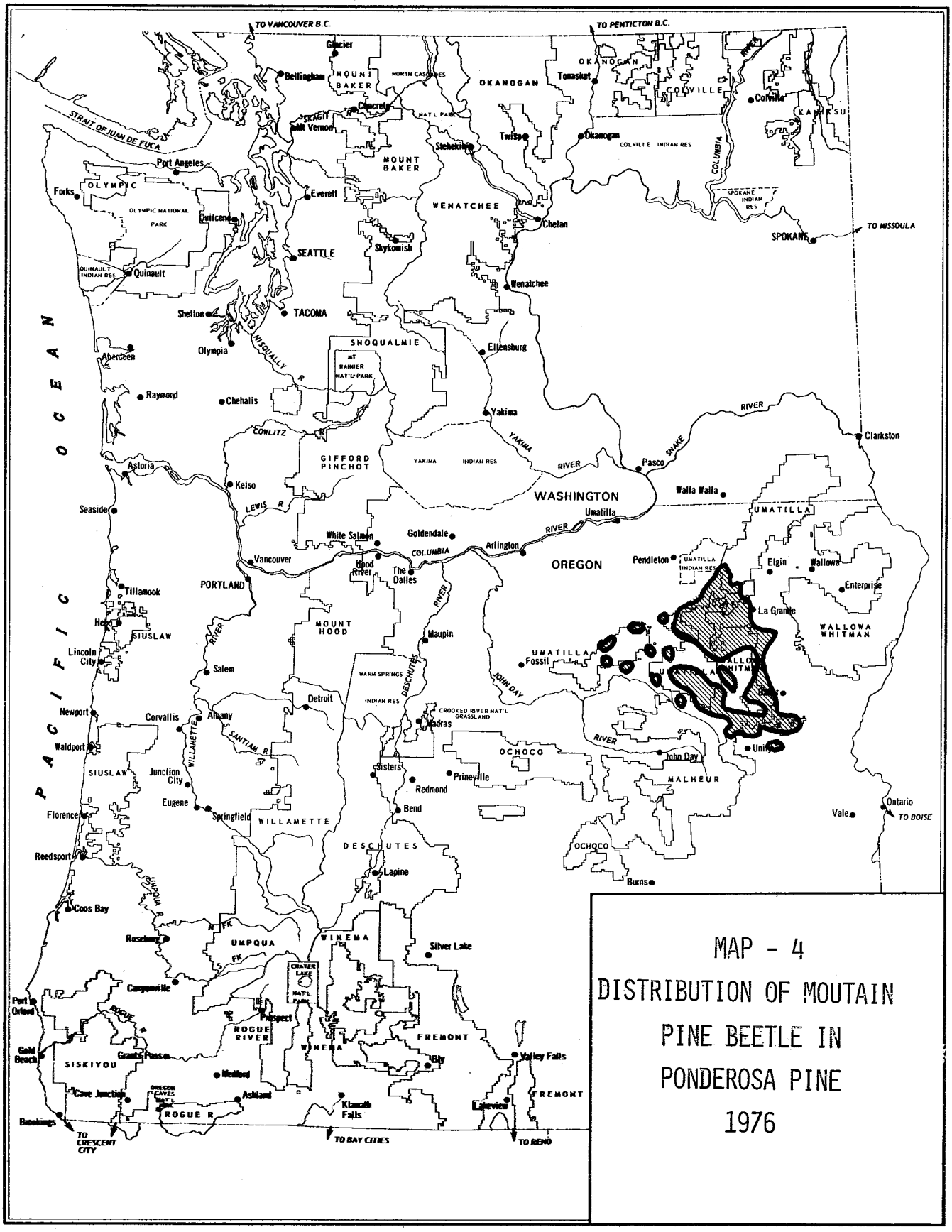
TO BAY CITIES
TO RENO
TO CRESCENT CITY
MAP - 2
MAJOR BARK BEETLE PROBLEMS
DOUGLAS-FIR BEETLE
WESTERN PINE BEETLE



MAP - 3

DISTRIBUTION OF MOUNTAIN PINE BEETLE IN LODGEPOLE PINE

1976



MAP - 4

DISTRIBUTION OF MOUTAIN PINE BEETLE IN PONDEROSA PINE

1976

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